



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/768,515	01/30/2004	Bhanwar Singh	AMDP999US/H1920	6654
23623 7590 06/27/2007 AMIN, TUROCY & CALVIN, LLP 1900 EAST 9TH STREET, NATIONAL CITY CENTER 24TH FLOOR, CLEVELAND, OH 44114			EXAMINER RUGGLES, JOHN S	
			ART UNIT 1756	PAPER NUMBER
			MAIL DATE 06/27/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.



UNITED STATES PATENT AND TRADEMARK OFFICE

---

Commissioner for Patents  
United States Patent and Trademark Office  
P.O. Box 1450  
Alexandria, VA 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/768,515  
Filing Date: January 30, 2004  
Appellant(s): SINGH ET AL.

**MAILED**  
**JUN 27 2007**  
**GROUP 1700**

---

Himanshu S. Amin  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed on 4/17/07 appealing from the final Office action mailed on 12/11/06.

Art Unit: 1756

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The Examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is substantially correct. The only change is to indicate that claims 9-23 have been canceled.

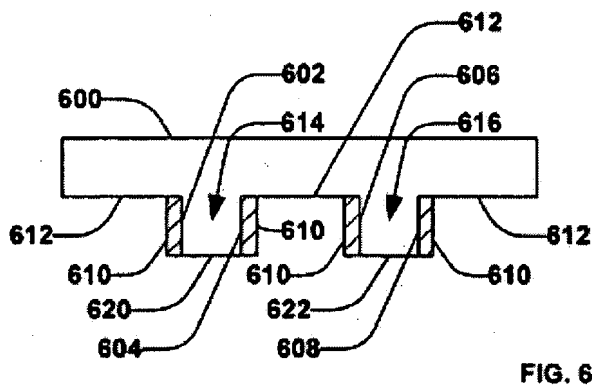
**(4) Status of Amendments After Final**

The Appellants' statement of the status of amendments after final rejection contained in the brief is substantially correct. The only change is to indicate that the entered after final amendment was filed on 2/12/07.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is substantially correct. The first paragraph describing independent claim 1 at the bottom of page 2 in the brief properly states each of the limitations recited in this claim. However, the drawings listed as Figures 1 and 2, as well as the corresponding description of these drawings in the specification (at page 6 line 15 to page 7 line 9) are actually drawn to *conventional prior art* masks 100 and 200, respectively (see the 11/6/06 amended drawings that clearly label instant Figures 1 and 2 as **prior art**, emphasis added).

Instead, independent claim 1 is actually better represented by the Figure 6 mask 600 (shown below) as described in the specification at page 8 lines 19-32.



Instant Figure 6 mask 600

Mask 600 has a translucent substrate with three-dimensional features comprising vertical sidewalls 602, 604, 606, and 608 between horizontal surfaces 612, 620, and 622. Each of the sidewalls 602, 604, 606, and 608 are coated with a layer of absorbing material 610.

Further at the bottom of page 2 in the brief, Appellants attempt to argue the provisions of 35 USC 112, sixth paragraph for the first time by relying upon the *conventional prior art* masks, rather than by relying on the instant mask 600 structure actually represented in Figure 6, as shown above. It is noted that instant independent claim 1 actually does include recitations of specific mask structure, so Appellants' reliance on 35 USC 112, sixth paragraph is misplaced. It is also noted that the means plus function type language "means for" is not specifically recited in instant claim 1.

#### **(6) Grounds of Rejection to be Reviewed on Appeal**

Appellants' statements of the grounds of rejection to be reviewed on appeal are substantially correct, except for the following changes.

Art Unit: 1756

On page 3 of the brief, under section VI. **A.**, Appellants' statement that claims 1 and 3 were rejected under 35 U.S.C. 102(b) alone as being "clearly anticipated" by Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) does not match the ground of rejection on appeal. Rather, claims 1 and 3 were actually rejected under *35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824)*, emphasis added.

Similarly on page 3 of the brief, under section VI. **B.**, Appellants' statement that claim 2 was rejected under 35 U.S.C. 102(b) alone as being "anticipated" by Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of Grant et al. does not match the ground of rejection on appeal. Rather, claim 2 was actually rejected under *35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of Grant et al.*, emphasis added.

#### **(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

Art Unit: 1756

**(8) Evidence Relied Upon**

Vasudev et al. ('450)	WO 94/17450	8-1994
Vasudev et al. ('824)	US 5,411,824	5-1995
Grant et al. (Grant & Hackh's Chemical Dictionary, Fifth Edition, 1987, Pages 261, 487)		
Hashimoto	US 5,786,114	6-1998
Takemura	US 5,530,265	6-1996
French et al.	US 2006/0051974	3-2006 (PCT filed 6-2003)
Aggas et al. ('157)	US 5,944,157	11-1999
Aggas et al. ('590)	US 6,020,590	2-2000
Yeh	US 2003/0193068	10-2003 (filed 4-2003)

**(9) Grounds of Rejection**

The text of those sections of Title 35, U.S. Code not included here can be found in a prior Office action.

The following ground(s) of rejection are applicable to the appealed claims:

*A. Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824).*

Vasudev et al. '450 teach a phase shifting mask (PSM) having trenches in a transparent or translucent quartz substrate (*instant claim 3*) to form shifters, in which the trenches have vertical sidewalls coated with an absorbing or attenuating film and methods of making this PSM (title, abstract). Exposure wavelengths include ultraviolet (UV), I-line (356nm), or deep UV (DUV, 248nm, p2/L20-34). Front page Figure 2A shows a PSM 30 having PS trenches 12 in a quartz or

Art Unit: 1756

glass substrate 11 with intermediate non-PS (3D) features between the trenches 12 having vertical sidewalls 13, in which only the vertical sidewalls 13 are coated with absorbing/attenuating material 31 (that either fully or partially absorbs incident light radiation and has a thickness of "t", p8/L20-25, p9/L32 to p10/L7). The absorbing/attenuating material 31 is either metal (e.g., chromium (Cr), molybdenum (Mo), aluminum (Al), gold (Au), etc.), an alloy thereof, a silicide thereof, or silicon (Si) typically having a thickness (t) or skin depth that is in the range of 100-500 Angstroms (10-50nm), in which t for Si material is appropriately designed to be greater than that for metallic material in order to achieve the same absorbance level of incident light radiation (p12/L2-27, p13/L26-31, p18/L21-27). Even though the sidewall absorbers 31 are described to reduce edge scattering of light on the vertical sidewalls for improved resolution of transmitted light (abstract), this PSM having sidewall absorbers 31 would also inherently block incident light falling on the absorbers 31 from the incident (upper or lower) horizontal surfaces of the absorbers, as well, while still allowing light rays to exit the opposite (lower or upper) horizontal PS and non-PS surfaces of the substrate 11 that are not covered by the absorbers 31. Since this mask has substantially the same structure as the instantly claimed mask, it would be expected to inherently function in the same manner as instantly claimed (see MPEP § 2112.01, I. and MPEP § 2114, *instant claim 1*).

Vasudev et al. '824 teach a phase shifting mask (PSM) having trenches in a transparent or translucent quartz substrate (*instant claim 3*) to form shifters, in which the trenches have vertical sidewalls coated with an absorbing or attenuating film (title, abstract, c2/L53-58). Exposure wavelengths include ultraviolet (UV), I-line (356nm), or deep UV (DUV, 248nm, c1/L53 to c2/L8). Figure 2A shows a PSM 30 having PS trenches 12 in a quartz or glass substrate 11 with

Art Unit: 1756

intermediate non-PS (3D) features between the trenches 12 having vertical sidewalls 13, in which only the vertical sidewalls 13 are coated with absorbing/attenuating material 31 (that either fully or partially absorbs incident light radiation and has a thickness of "t", c3/L36-41, c4/L13-26). The absorbing/attenuating material 31 is either metal (e.g., chromium (Cr), molybdenum (Mo), aluminum (Al), gold (Au), etc.), an alloy thereof, a silicide thereof, or silicon (Si) typically having a thickness (t) or skin depth that is in the range of 100-500 Angstroms (10-50nm), in which t for Si material is appropriately designed to be greater than that for metallic material in order to achieve the same absorbance level of incident light radiation (c5/L20-43, c5/L63-68). Even though the sidewall absorbers 31 are described to reduce edge scattering of light on the vertical sidewalls for improved resolution of transmitted light (abstract), this PSM having sidewall absorbers 31 would also inherently block incident light falling on the absorbers 31 from the incident (upper or lower) horizontal surfaces of the absorbers, as well, while still allowing light rays to exit the opposite (lower or upper) horizontal PS and non-PS surfaces of the substrate 11 that are not covered by the absorbers 31. Since this mask has substantially the same structure as the instantly claimed mask, it would be expected to inherently function in the same manner as instantly claimed (see MPEP § 2112.01, I. and MPEP § 2114, *instant claim 1*).

*B. Claim 2 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of Grant et al. (Grant & Hackh's Chemical Dictionary, Fifth Edition, 1987).*

While each teaching a mask having 3D features with vertical sidewalls coated with absorbing material on a translucent quartz or glass substrate, neither Vasudev et al. '450 nor

Art Unit: 1756

Vasudev et al. '824 specifically teach that the quartz or glass substrate comprises silicon dioxide ( $\text{SiO}_2$ , *instant claim 2*). However, Grant et al. specifically define quartz as being silica or silicon dioxide ( $\text{SiO}_2$ , page 487) and further define silica glass as having over 96%  $\text{SiO}_2$  (page 261). Therefore, it is clear that the translucent glass substrate of either Vasudev et al. '450 or Vasudev et al. '824 encompasses a silica glass substrate comprising  $\text{SiO}_2$  (*instant claim 2*), within the accepted meanings of these terms.

*C. Claims 4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of Hashimoto (US 5,786,114).*

While teaching other aspects of the instant claims, neither Vasudev et al. '450 nor Vasudev et al. '824 specifically teach that the mask or PSM has absorbing material comprising silicon oxynitride ( $\text{SiON}$ , *instant claim 4*) or titanium nitride ( $\text{TiN}$ , *instant claim 8*).

Hashimoto teaches a PSM having a patterned layer of attenuating or absorbing material 11 (e.g.,  $\text{SiON}$ ,  $\text{TiN}$ ,  $\text{SiN}$ ,  $\text{SiN}_x$ ,  $\text{SiO}$ , etc.) with a transmissivity of 3% (absorbing 97% of incident UV exposure light, which is considered to be sufficiently opaque to ensure isolation of exposure light in frame or edge regions 19) on a suitable light transmissive or translucent substrate 13 (e.g., quartz, etc.), as shown in Figures 2A-2C (title, abstract, c4/L54-c5/L21). Thus,  $\text{SiON}$  and  $\text{TiN}$  have each been known as alternative absorbing materials for some time that have sufficiently high absorbance of UV exposure light to be considered as alternative opaque or absorbing materials with proven utility on a mask, such as a PSM.

It would have been obvious to one of ordinary skill in the art at the time of the invention in a mask having absorbing material deposited on vertical sidewalls of 3D features (as taught by

Art Unit: 1756

either Vasudev et al. '450 or Vasudev et al. '824) to use either SiON or TiN for the absorbing material, because SiON and TiN have been known for some time as being alternative opaque or absorbing materials toward UV exposure light with proven utility on a mask (as taught by Hashimoto, *instant claims 4 and 8*).

*D. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of either Takemura (US 5,530,265) or French et al. (US 2006/0051974).*

While teaching other aspects of the instant claim, neither Vasudev et al. '450 nor Vasudev et al. '824 specifically teach that the mask or PSM has absorbing material comprising silicon-rich (silicon) nitride (Si-rich SiN, *instant claim 5*).

Takemura teaches patterning through a patterned resist 107 of an underlying Si-rich SiN layer (106, preferably having a thickness of 50nm or more) that is known as an exemplary "masking" (e.g., absorbing, etc.) material (for e.g., UV light, etc.), as shown in Figure 1(c) (c6/L18-25, *instant claim 5*).

French et al. teach a halftone mask (which is an attenuating or a partially absorbing PSM), a method of making this mask, and a method of using this mask (title, abstract, [0012]-[0014]). Figure 2(a) shows the exposure of a resist 10 through a halftone mask 12 having a UV-transparent or translucent mask substrate 14, a patterned layer of Si-rich SiN ( $\text{SiN}_x\text{:H}$  with  $x$  in the range of 0 to 1) half-tone mask material 16 on the substrate and a Cr light blocking layer 18 over part of the Si-rich SiN half-tone mask material. In half-tone regions 24, only the half-tone mask material without Cr is present, where the transmission of UV light is in the range of 20% to 80% (absorbing 80% to 20% of incident UV exposure light [0023]). The use of Si-rich SiN

Art Unit: 1756

(silicon nitride) offers the further benefit that the precise properties of the Si-rich SiN layer 16 may be varied depending in particular on the wavelength of light emitted by the UV light source 30 [0033]. Figure 5 shows the effect of changing the optical band gap for a 60 nm thick layer of (Si-rich) SiN. The optical transmission is a strong function of the band gap. Accordingly, by controlling the band gap it is a relatively straight forward problem to accurately control the transmission or absorption through the (Si-rich) SiN mask layer 16, which is preferably manufactured to have a band gap in the range 2.15 eV to 2.35 eV to correspond with the wavelengths of widely used UV light sources 30, in particular the i-line, h-line or g-line wavelengths of mercury lamps ([0036], *instant claim 5*).

It would have been obvious to one of ordinary skill in the art at the time of the invention in a mask having absorbing material deposited on vertical sidewalls of 3D features (as taught by either Vasudev et al. '450 or Vasudev et al. '824) to use Si-rich SiN for the absorbing material with a reasonable expectation of forming a useful mask, because Si-rich SiN is a known alternative absorbing material for UV light (as taught by Takemura) that offers the further benefit of accurately variable transmission or absorbance of UV exposure light by controlling the band gap of the Si-rich SiN to correspond with the particular wavelength of the UV exposure light (as taught by French et al., *instant claim 5*).

Art Unit: 1756

*E. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of either Aggas et al. (US 5,944,157) or Aggas et al. (US 6,020,590).*

While teaching other aspects of the instant claim, neither Vasudev et al. '450 nor Vasudev et al. '824 specifically teach that the mask or PSM has absorbing material comprising silicon-rich (silicon) oxide (Si-rich Si-O, *instant claim 6*).

Aggas et al. '157 teach that a layer of Si-rich Si-O blocks or absorbs 80% to 100% of incident UV light (e.g., Si-rich Si-O absorbs about 90% of i-rays at a wavelength of 365nm from an exposure stepper, etc.), while still being substantially transparent to visible light wavelengths. Such a Si-rich Si-O can be made to have a desired complex refractive index spectra from an appropriate ratio of Si to O during formation by either plasma enhanced chemical vapor deposition (PECVD) or sputtering (c7/L10-52).

Aggas et al. '590 teach that a layer of Si-rich Si-O blocks or absorbs 80% to 100% of incident UV light (e.g., Si-rich Si-O absorbs about 90% of i-rays at a wavelength of 365nm from an exposure stepper, etc.), while still being substantially transparent to visible light wavelengths. Such a Si-rich Si-O can be made to have a desired complex refractive index spectra from an appropriate ratio of Si to O during formation by either plasma enhanced chemical vapor deposition (PECVD) or sputtering (c7/L10-52).

It would have been obvious to one of ordinary skill in the art at the time of the invention in a mask having absorbing material deposited on vertical sidewalls of 3D features (as taught by either Vasudev et al. '450 or Vasudev et al. '824) to use Si-rich Si-O for the absorbing material with a reasonable expectation of forming a useful mask, because Si-rich Si-O is a known

Art Unit: 1756

alternative absorbing material for UV exposure light that offers the benefit of being made to have a desired absorbance of UV exposure light wavelengths while still being substantially transparent to visible light wavelengths by just varying the ratio of Si to O during formation of the Si-rich Si-O layer (as taught by either Aggas et al. '157 or Aggas et al. '590, *instant claim 6*).

*F. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of Yeh (US 2003/0193068).*

While teaching other aspects of the instant claim, neither Vasudev et al. '450 nor Vasudev et al. '824 specifically teach that the mask or PSM has absorbing material comprising silicon oxycarbidenitride (SiOCN, *instant claim 7*).

Yeh teaches that a layer of SiONC or SiOCN is semi-transparent or partially absorbing for excimer laser wavelengths (which are understood to include UV light wavelengths, e.g., 157nm, 193nm, 248nm, etc.). Such a SiOCN layer (e.g., at a thickness of 800nm, etc.) can be formed by PECVD from tetramethylsilane, oxygen, and nitrogen as source materials to achieve a desired absorbing coefficient for a target UV light wavelength (so that a SiOCN layer of the same thickness can have a widely variable absorbing coefficient, e.g.,  $12,000\text{ cm}^{-1}$ ,  $4,000\text{ cm}^{-1}$ , etc., [0009], [0035], [0041], presumably based on differing PECVD process conditions during formation of the SiOCN layer, *instant claim 7*).

It would have been obvious to one of ordinary skill in the art at the time of the invention in a mask having absorbing material deposited on vertical sidewalls of 3D features (as taught by either Vasudev et al. '450 or Vasudev et al. '824) to use SiOCN for the absorbing material with a reasonable expectation of forming a useful mask, because SiOCN is a known alternative absorbing material for UV light that offers the benefit of being made to have a desired

Art Unit: 1756

absorbance of a target UV light wavelength by varying PECVD process conditions during formation of the SiOCN layer from tetramethylsilane, oxygen, and nitrogen source materials (as taught by Yeh, *instant claim 7*).

**(10) Response to Argument**

*A. Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824).*

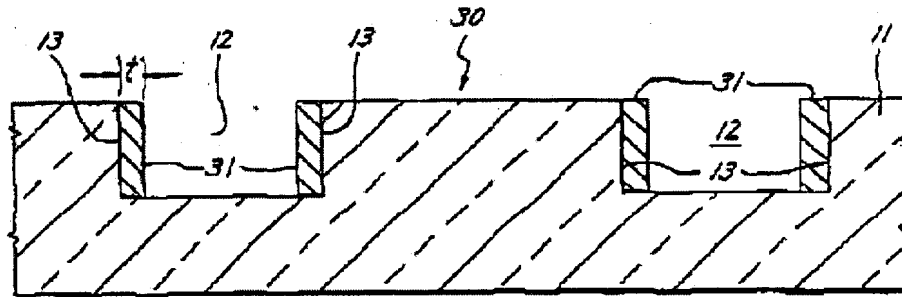
*Response to the arguments under sub-section A. on pages 3-6 of the brief:*

In the brief at the bottom of page 3, Appellants argue against a different ground of rejection from that actually relied upon by the Examiner (as indicated above).

On page 4, Appellants rely upon the claimed mask as being *for a nanoprint lithographic process*, but this italicized limitation is not actually recited in any of the rejected claims.

Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Appellants concede on page 4 of the brief that both Vasudev et al. references ('450 and '824) are counterpart documents relating to the same subject matter. For the purpose of the responses to Appellants' arguments and also for the Board's convenience, Figure 2A on the front page of the Vasudev et al. '450 reference is reproduced below.



Vasudev et al. '450 - Figure 2A mask 30

In the mask 30 of Vasudev et al. '450 Figure 2A, the quartz (*instant claim 3*) or glass substrate 11 meets the instant *translucent substrate* limitation. The phase shifting (PS) trenches 12 are separated by intermediate non-PS (3D) features on both sides of each trench 12 having vertical sidewalls 13, which meets the instant requirement for *one or more three-dimensional features comprising one or more vertical sidewalls*. The absorbing material 31 coated on the vertical sidewalls 13 reads on the instant mask *absorbing material deposited upon one or more of the vertical sidewalls so that light will be absorbed by the absorbing material (resulting in light blocking features)*. The instant mask requirement of *one or more horizontal surfaces formed upon one or more of the three-dimensional features* is also shown by the prior art Vasudev et al. '450 mask 30 illustrated above.

Appellants do not specifically dispute that the instant mask has substantially the same actual structure and materials as taught by the prior art. In fact, Appellants are actually relying upon a different intended use or function for the instantly claimed mask having substantially the same structure as the prior art mask (which is exemplified by Vasudev et al. '450 Figure 2A, shown above). Appellants contend that the instant intended use or function for this mask structure having sidewall absorbing features is to block light in an incident direction to an upper

Art Unit: 1756

surface of the substrate and allow light to exit a lower surface of the substrate unobstructed by the absorbing material.

Even though Vasudev et al. '450 describes the function or intended use of the sidewall absorbers 31 for reducing edge scattering of light on the vertical sidewalls 13 for improved resolution of transmitted light through mask 30, the sidewall absorbers 31 would also inherently block light in an incident direction to an upper surface of the substrate 11 (where the absorbing material 31 is located on the vertical sidewalls 13 of trenches 12), while still allowing light to exit a lower (horizontal) surface of the substrate 11 (where) unobstructed by the absorbing material 31. Since the masks taught by either Vasudev et al. '450 or Vasudev et al. '824 have substantially the same structure as the instantly claimed mask, either of these prior art masks would be expected to inherently function in the same manner as instantly claimed (see MPEP § 2112.01, I. and MPEP § 2114, *instant claim 1*), as previously pointed out. While arguing that the Vasudev et al. references do not specifically describe the instant intended use or function of such mask structures having vertical sidewall absorbers, Appellants have failed to show that the Vasudev et al. mask structures are not capable of performing in the manner described by the previous 12/11/06 Office action on pages 6-8. In fact, the Vasudev et al. prior art vertical sidewall absorbers would be considered effective for blocking light from any direction or any angle. Furthermore, these prior art sidewall absorbers would be especially effective for blocking incident vertical light due to the apparent greater thickness in the vertical direction than in the horizontal direction of these prior art sidewall absorbers.

On page 5 of the brief, Appellants contend that the prior art sidewall absorbers (by themselves) in the Vasudev et al. mask structures do not contribute in any way to the patterning

Art Unit: 1756

resulting from these prior art mask structures (in reference to the Figure 3 intensity profiles for PS mask structures with or without sidewall absorbers), inferring that these prior art sidewall absorbers cannot be construed as inherently resulting in light blocking features. However, these Figure 3 intensity profiles are only exemplary for prior art mask structures under specified conditions (Vasudev et al. '450, p11/L21-27 or Vasudev et al. '824, c4/L45-55), whereas other teachings of either Vasudev et al. '450 (e.g., p13/L13 to p14/L17, etc.) or Vasudev et al. '824 (e.g., c6/L7-21, etc.) for such mask structures having sidewall absorbers are not limited to the Figure 3 specified conditions. Thus, it is still believed that the vertical sidewall absorbers (e.g., 31 in Vasudev et al. '450 Figure 2A, etc.) are inherently light blocking features toward incident vertical light, even if this is not expressly stated by either of the Vasudev et al. references.

Appellants also assert on page 5 of the brief that interpreting the prior art mask sidewall absorbers in either of the Vasudev et al. references as light blocking features would lead away from the disclosure of these prior art references and would destroy the functionality of these prior art masks, but they fail to articulate their reason for this position. Since the prior art mask vertical sidewall absorbers are expressly described to block edge scattering light incident at various angles on the vertical surfaces of trench sidewalls against 3D features on the mask while still allowing light to pass through the PS trench and non-PS 3D feature horizontal surfaces left uncovered by the vertical sidewall absorbers, one of ordinary skill in the art would have a reasonable expectation that these vertical sidewall absorbers would also be inherently effective at blocking vertical incident light falling on horizontal surfaces of the vertical sidewall absorbers. Therefore, Appellants' arguments are both misdirected and unpersuasive.

Art Unit: 1756

*B. Claim 2 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of Grant et al. (Grant & Hackh's Chemical Dictionary, Fifth Edition, 1987).*

*Response to the arguments under sub-section B. on page 6 of the brief:*

In this section of the brief, Appellants argue against a different ground of rejection from that actually relied upon by the Examiner (as indicated above).

Claim 2 depends from independent claim 1, which is addressed above. The masks taught by either Vasudev et al. '450 or Vasudev et al. '824 as evidenced by Grant et al. have substantially the same structure and materials as the instantly claimed mask, so either of these prior art masks as evidenced by Grant et al. would be expected to inherently function in the same manner as instantly claimed (for at least the same reasons as stated above, *instant claim 2*). Therefore, Appellants' arguments are both misdirected and unpersuasive.

*C. Claims 4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of Hashimoto (US 5,786,114).*

*Response to the arguments under sub-section C. on page 6 of the brief:*

Claims 4 and 8 each depend from independent claim 1, which is addressed above. It would have been obvious to one of ordinary skill in the art at the time of the invention in a mask having absorbing material deposited on vertical sidewalls of 3D features (as taught by either Vasudev et al. '450 or Vasudev et al. '824) to use either SiON or TiN for the absorbing material, because SiON and TiN have been known for some time as being alternative opaque or absorbing

Art Unit: 1756

materials toward UV exposure light with proven utility on a mask (as taught by Hashimoto, *instant claims 4 and 8*). Therefore, Appellants' additional arguments are unpersuasive.

*D. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of either Takemura (US 5,530,265) or French et al. (US 2006/0051974).*

*Response to the arguments under sub-section D. on page 6 of the brief:*

Claim 5 depends from independent claim 1, which is addressed above. It would have been obvious to one of ordinary skill in the art at the time of the invention in a mask having absorbing material deposited on vertical sidewalls of 3D features (as taught by either Vasudev et al. '450 or Vasudev et al. '824) to use Si-rich SiN for the absorbing material with a reasonable expectation of forming a useful mask, because Si-rich SiN is a known alternative absorbing material for UV light (as taught by Takemura) that offers the further benefit of accurately variable transmission or absorbance of UV exposure light by controlling the band gap of the Si-rich SiN to correspond with the particular wavelength of the UV exposure light (as taught by French et al., *instant claim 5*). Therefore, Appellants' additional arguments are unpersuasive.

*E. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of either Aggas et al. (US 5,944,157) or Aggas et al. (US 6,020,590).*

*Response to the arguments under sub-section E. on page 7 of the brief:*

Claim 6 depends from independent claim 1, which is addressed above. It would have been obvious to one of ordinary skill in the art at the time of the invention in a mask having absorbing material deposited on vertical sidewalls of 3D features (as taught by either Vasudev et

Art Unit: 1756

al. '450 or Vasudev et al. '824) to use Si-rich Si-O for the absorbing material with a reasonable expectation of forming a useful mask, because Si-rich Si-O is a known alternative absorbing material for UV exposure light that offers the benefit of being made to have a desired absorbance of UV exposure light wavelengths while still being substantially transparent to visible light wavelengths by just varying the ratio of Si to O during formation of the Si-rich Si-O layer (as taught by either Aggas et al. '157 or Aggas et al. '590, *instant claim 6*). Therefore, Appellants' additional arguments are unpersuasive.

*F. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over either Vasudev et al. (WO 94/17450) or Vasudev et al. (US 5,411,824) in view of Yeh (US 2003/0193068).*

*Response to the arguments under sub-section F. on page 7 of the brief:*

Claim 7 depends from independent claim 1, which is addressed above. It would have been obvious to one of ordinary skill in the art at the time of the invention in a mask having absorbing material deposited on vertical sidewalls of 3D features (as taught by either Vasudev et al. '450 or Vasudev et al. '824) to use SiOCN for the absorbing material with a reasonable expectation of forming a useful mask, because SiOCN is a known alternative absorbing material for UV light that offers the benefit of being made to have a desired absorbance of a target UV light wavelength by varying PECVD process conditions during formation of the SiOCN layer from tetramethylsilane, oxygen, and nitrogen source materials (as taught by Yeh, *instant claim 7*). Therefore, Appellants' additional arguments are unpersuasive.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

***Conclusion******Response to the conclusion section on page 8 of the brief:***

In response to Appellants' conclusion statement, it is still believed that instant claims 1-8 are unpatentable over the prior art rejections discussed above. Appellants rely on the unclaimed intended use or function of the claimed mask *for a nanoprint lithographic process*. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims, as indicated above.

Appellants are actually relying upon a different intended use or function for the instantly claimed mask having substantially the same structure and materials as the prior art mask. Since the prior art mask vertical sidewall absorbers are expressly described to block edge scattering light incident at various angles on the vertical surfaces of trench sidewalls against 3D features on the mask while still allowing light to pass through the PS trench and non-PS 3D feature horizontal surfaces left uncovered by the vertical sidewall absorbers, one of ordinary skill in the art would have a reasonable expectation that these vertical sidewall absorbers would also be inherently effective at blocking vertical incident light falling on horizontal surfaces of the vertical sidewall absorbers.

Art Unit: 1756

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

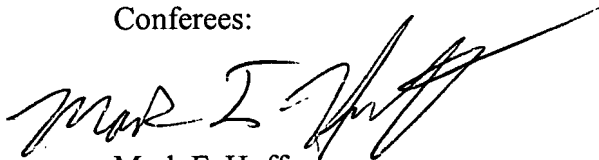


John Ruggles  
Examiner  
Art Unit 1756

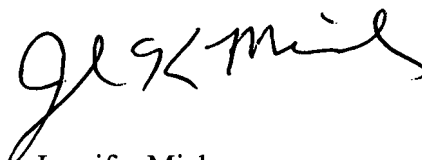
jsr

June 12, 2007

Conferees:



Mark F. Huff  
Supervisory Patent Examiner  
Art Unit 1756



Jennifer Michener  
TC Appeals Specialist  
Technology Center 1700